| 1 | In the claims: |
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| 2 | 1. A flex circuit for use in a fuel cell, the flex circuit, comprising: |
| 3 | a fuel-side flexible circuit, comprising: |
| 4 | a first flex substrate, wherein the first flex substrate comprises openings |
| 5 | through which pass liquid fuel, |
| 6 | a first porous layer adjacent the first flex substrate, the first porous layer |
| 7 | including a first catalyst layer, |
| 8 | an anode electrode between the first flex substrate and the first porous |
| 9 | layer, and |
| 10 | a boundary layer disposed adjacent the first porous layer, the boundary |
| 11 | layer preventing cross-over of the liquid fuel; |
| 12 | an air/water-side flexible circuit, disposed in parallel with the fuel-side flexible |
| 13 | circuit, comprising: |
| 14 | a second flex substrate, wherein the second flex substrate comprises |
| 15 | openings through which pass water, |
| 16 | a second porous layer adjacent the second flex substrate, the second |
| 17 | porous layer including a second catalyst layer, and |
| 18 | a cathode electrode between the second flex substrate and the second |
| 19 | porous layer; and |
| 20 | a center section disposed between the first and the second flex circuits, wherein |
| 21 | the first and the second flex substrates are conformable to non-planar shapes. |
| 22 | 2. The flex circuit of claim 1, wherein the center section is a proton exchange |
| 23 | membrane. |
| 24 | 3. The flex circuit of claim 1, wherein the center section is a channel carrying |
| 25 | dionized water, the center section further comprising spacers to maintain a separation |
| 26 | between the fuel-side flexible circuit and the air/water-side flexible circuit. |
| 27 | 4. The flex circuit of claim 1, wherein the flex circuit is formed in a shape of a |
| 28 | cylinder. |
| 29 | 5. The flex circuit of claim 4, wherein the liquid fuel is contained within an interior of |
| 30 | the cylindrical flex circuit. |

HP 10006771-1 10

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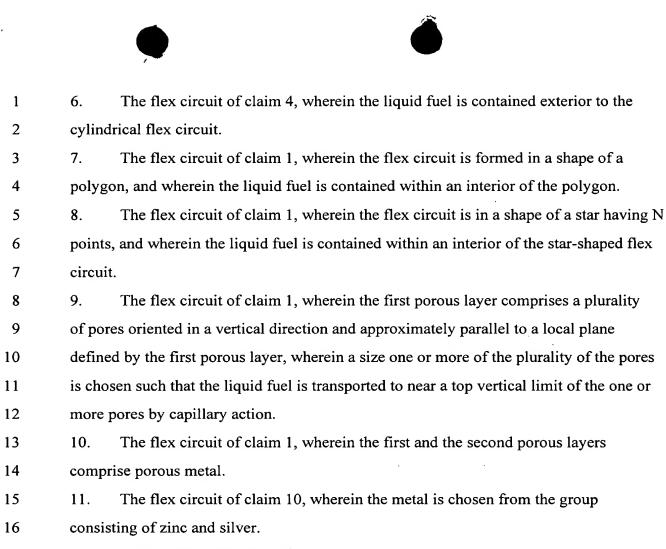
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12. A flex-based fuel cell, comprising:

a first flexible circuit; comprising:

a first flexible/substrate, and

a porous metal/catalyst layer, wherein the porous metal/catalyst layer comprises a plurality of pores oriented to distribute fuel to substantially all of the first flexible circuit using a capillary action;

a separation section adjacent the first flexible circuit; and

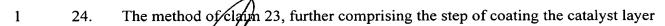
a second flexible circuit adjacent the separation circuit, wherein the first and the second flexible circuits are conformable to a substantially non-planar shape.

- 13. The flex-based fuel cell of claim 12, wherein the separation section is a proton exchange membrane.
- 28 14. The flex-based fuel cell of claim 12, wherein the separation section is a channel comprising dionized water.
- The flex-based fuel cell of claim 12, wherein the substantially non-planar shape

11

| 1 | comprises a dylinder. |
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| 2 | 16. The flex-based fuel cell of claim 15, wherein an interior of the cylindrical flex- |
| 3 | based fuel cell comprises liquid fuel. |
| 4 | 17. The flex-based fuel cell of claim 16, wherein the liquid fuel is methanol. |
| 5 | 18. The flex-based fuel cell of claim 12, further comprising a dry film adhesive |
| 6 | disposed between the first flexible substrate and the second flexible substrate. |
| 7 | 19. A flex-based fuel cell, comprising: |
| 8 | means for converting liquid fuel to protons, comprising: |
| 9 | means for transporting liquid fuel through the liquid fuel converting |
| 10 | means, and |
| 11 | first means for flexibly supporting the liquid fuel converting means; |
| 12 | means for receiving the protons, comprising: |
| 13 | means for converting the protons to water vapor, and |
| 14 | second means for flexibly supporting the proton converting means; and |
| 15 | means for exchanging the protons from the liquid fuel converting means to the |
| 16 | proton converting means |
| 17 | 20. The flex-based fuel dell of claim 19, wherein the liquid fuel transporting means |
| 18 | comprises a porous metal layer having means for causing capillary transport of the liquid |
| 19 | fuel within the porous metal layer. |
| 20 | 21. The flex-based fuel cell of claim 19, wherein the proton exchanging means |
| 21 | comprises a proton exchange membrane. |
| 22 | 22. The flex-based fuel cell of claim 19, wherein the proton exchanging means |
| 23 | comprises a dionized water channel |
| 24 | 23. A method of preparing a flex circuit for a fuel cell, comprising: |
| 25 | patterning a conductive material on flex supporting means having a front surface |
| 26 | and a back surface, wherein the conductive material is patterned on the front surface; |
| 27 | attaching a layer of porous material to the conductive material; |
| 28 | depositing a layer of catalytic coating on the surface of the porous material; and |
| 29 | ablating the supporting means from the back surface to make openings so that |
| 30 | the porous material is exposed. |

HP 10006771-1 12



with a thin layer of proton transfer membrane.

13